Docket No. 87324.1780
Serial No. 10/671,707
Customer No. 30734

Amendments to the Specification:

[0005] Accordingly, it is desirable to provide a method of casting SSM metals and alloys utilizing conventional and/or rheocasting die casting devices that can impart desirable mechanical properties. It is further desirable to provide a process to control the shrink porosity of cast parts at multiple locations ~~though out~~ throughout a part. Further still, it is desirable to provide a method of producing products with metal alloy castings wherein the temperature of the semi-solid metal slurry can be controlled.

[0021] In operation of the vertical die casting machine or press described above in connection with FIG. 1, a predetermined charge or shot of molten metal is poured into the shot sleeve 60 in the pour station 80. The shot sleeves 60 can be equipped with heaters and temperature sensors to heat and or cool the metal as is desirable at any time, including the period while table 50 indexes 180 degrees. The lateral transfer of the molten metal and the upward injection of the metal into the mold cavities is also effective to degas the molten metal, thereby minimizing porosity of the solidified die cast parts. Preferably, a light suction is applied to the cavities ~~108~~ 61 and runner ~~202~~ and the injecting chamber 146 to remove air from the chamber and to remove the gas separated from the molten metal within the shot cylinder.

[0022] It has now been found that the above described press can also be used for SSM casting. The use of metal slurry ~~metal~~ over molten metal reduces fluid turbulence when injected into the die, which also reduces the amount of air that may be trapped in the final part. Less air in the final part lends greater mechanical integrity and allows cast products to be heat treated. Reduced porosity leads to reduced blistering of the part upon the application of a heat treatment.

In addition, metals that are SSM ~~casting requires~~ cast require less heat thereby reducing cost and improving longevity of the molds and dies.

[0023] Without being limited to or bound by theory, the microstructure of SSM cast products can determine the mechanical properties of the product. Moreover, it ~~is~~ will be understood by those of ordinary skill in the art that the microstructure can be manipulated prior to casting. One way to manipulate the final microstructure of an SSM cast part is to control, thereby reduce, the time the metal remains in the SSM range. The presses described above afford such an opportunity. Specifically, the indexing time (i.e., the delay between indexing between the pour station 80 and transfer station 85) can be used to control the time the molten metal is cooled in the shot sleeve to reach the SSM range. That is, the amount of time the metal spends in the shot sleeve before it is injected into the molds can be regulated or optimized for a desirable microstructure. Alternatively, molten metal at a predetermined temperature may be poured into the shot sleeve of shuttle presses, i.e. presses that lack the indexing feature.

[0025] Preferably, the metal is to be cast is heated in a range from about 10°C to about 15°C above the liquidus temperature (i.e., the semi-solid temperature). For Al-Si alloys this generally ranges from about 585°C to about 590°C. The melt temperature is then allowed to cool to form a semi-solid slurry before it is finally cast.